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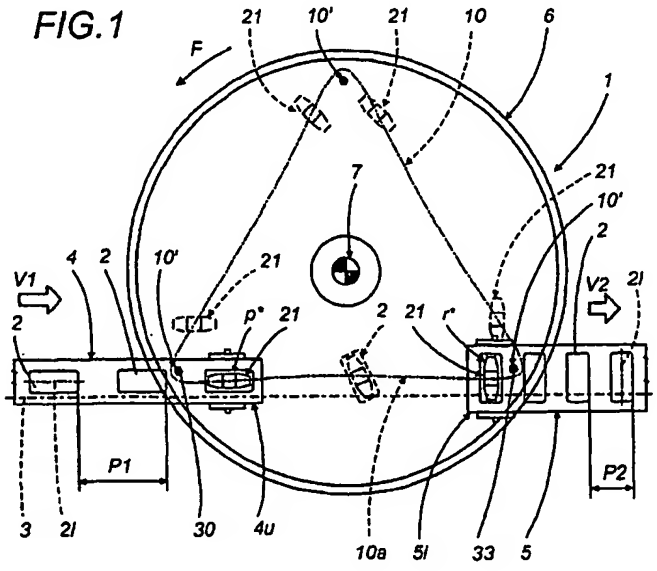
(54) A device for conveying products

(57) Absorbent pads (2) passing along a feed path (3) advance first on an infeed conveyor (4) at a first pitch (P1) and a first velocity (V1), then on an outfeed conveyor (5) at a second pitch (P2) and a second velocity (V2). The transfer from infeed to outfeed is effected by means of a head (6) disposed between the two conveyors (4, 5), rotatable about a vertical axis (7) and carrying at least one handler unit (9) equipped with a suction cup (21) coupled to an epicyclic train (26) inside the head and made to orbit around the axis (7) following a looped trajectory (10); the head (6) also comprises a cam and rocker mechanism (43) operating in conjunction with a lever mechanism (15) by which the suction cup (21) is lowered and raised in a direction parallel to the axis (7) of rotation when passing through points (p*, r*) at which the pads (2) are picked up from the infeed conveyor (4) and released onto the outfeed conveyor (5), respectively. Being adjustable, the cam and rocker mechanism (43) also provides means by which to vary the positions of the pickup point (p*) and the release point (r*).

FIG.1



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so of adjusting the pickup and release operations in such a way that these same operations can be timed to occur at different points along a given feed path, and in general of overcoming the problems outlined above with reference to the prior art.

[0013] The stated object is realized in a device according to the invention for conveying products directed along a feed path, comprising an infeed conveyor on which the products advance in succession at a first pitch and at a first velocity; an outfeed conveyor on which the products advance at a second pitch and at a second velocity; a transfer head located in part between the two conveyors, rotatable about an axis disposed orthogonally to the feed path and carrying at least one handler unit equipped with a relative uplifter by which the products are picked up; transmission means disposed and embodied in such a way as to advance the handler unit, when the head is set in rotation, along a looped trajectory exhibiting at least a first vertex located above the infeed conveyor, a second vertex located above the outfeed conveyor, and a branch extending above the feed path between the selfsame two vertices; also actuating means operating mechanically one in conjunction with another, disposed and embodied in such a way that when the head is set in rotation, the uplifter can be displaced along a controlled direction substantially parallel with the axis of rotation, toward and away from the feed path, and positioned thus to coincide with a point at which the products are picked up from the infeed conveyor and a point at which the products are released onto the outfeed conveyor, characterized in that the actuating means are adjustably positionable in relation one to another and to the transmission means in such a way as to allow of varying the position of the pickup point and the position of the release point to suit a given angular velocity of the transmission means.

[0014] The invention will now be described in detail, by way of example, with the aid of the accompanying drawings, in which:

- fig 1 illustrates a device for conveying products according to the invention, viewed schematically and in plan with certain parts omitted for clarity;
- fig 2 is a graph in which the curve indicates the velocities of a handler unit forming part of the device in fig 1;
- fig 3 illustrates a detail of fig 1, viewed partly in section and with parts omitted for clarity;
- fig 4 illustrates a detail of fig 3, viewed partly in section and with parts omitted for clarity;
- fig 5A and fig 5B illustrate a detail of fig 3, viewed schematically in a side elevation and in two operating conditions;
- fig 6 illustrates a detail of fig 5A and fig 5B, viewed schematically in a side elevation;
- fig 7 shows the same detail as in fig 6, viewed in plan and with certain parts omitted for clarity.

[0015] With reference to fig 1 of the drawings, 1 denotes a device, in its entirety, for conveying products 2 caused to advance continuously and equidistantly along a predetermined feed path 3 afforded by an infeed conveyor 4 and an outfeed conveyor 5, both rectilinear, which are axially aligned, arranged in succession and spaced apart one from the other.

[0016] The products 2, of which a typical example would be absorbent pads (as in sanitary towels or napkins) appearing substantially rectangular viewed in plan, are caused to advance along the infeed conveyor 4 at a first velocity V1, distanced one from the next at a first pitch P1 and occupying a first position in space with their relative longitudinal axes 2L disposed parallel to the feed path 3.

[0017] The products on the outfeed conveyor 5 are spaced apart at a second pitch P2 and caused to advance at a second velocity V2 occupying a second position in space, rotated through 90° relative to the first, hence with the respective longitudinal axes 2L disposed substantially normal to the feed path 3.

[0018] As discernible from figs 1 and 3, the device 1 also comprises a transfer head 6 by which the products 2 are advanced and rotated, consisting in a carousel platform 6a surmounted by and rigidly associated with a bell housing 6b.

[0019] The transfer head 6 is power driven and rotatable with respect to a fixed frame 60 about a vertical axis 7 disposed orthogonally to the feed path 3, in an anticlockwise direction denoted F. Lying in part between the infeed and outfeed conveyors 4 and 5, the head 6 carries three handler units 9 equispaced around the axis of rotation 7 and furnished with respective uplifters 21 capable of picking up the products 2 by conventional means. Fig 1 illustrates a number of the uplifters 21, advancing around the axis 7 of rotation, of which just two are shown in bold line and the remainder in phantom line.

[0020] As indicated in figs 3 and 4, the handler units 9 are associated mechanically with the head 6 by way of transmission means denoted 40 in their entirety, disposed and embodied in such a way that when the platform 6a is set in rotation, the handler units 9 and the relative uplifters 21 are caused to advance along a looped trajectory 10 extending around the axis 7 of rotation.

[0021] Purely in the interests of clarity, it can usefully be stated at this point that a preferred embodiment of the device 1, as illustrated in figs 1 and 4, will incorporate transmission means 40 structured in such a way that the handler units 9 are caused to follow a substantially triangular trajectory 10 comprising three substantially rectilinear branches interconnected by three bends having a short radius of curvature centred on the respective vertex 10'.

[0022] As indicated in fig 1, two of the vertices 10', denoted 30 and 33 to facilitate identification, are located respectively above the infeed conveyor 4 and above the

[0035] In addition to the first lever 24, the linkage 15 comprises a second lever 16 connected mechanically to the first and to the uplifter 21. The second lever 16 is anchored pivotably by a first end to a wall of the transfer head 6 and by a second end, remote from the first end, to the second tubular shaft 22. The first lever 24 is mounted pivotably at an intermediate point to an element 17 rigidly associated with the head 6, and articulated by way of a first joint 20, at the end opposite from that which carries the roller 14, to the top end of a rod 23.

[0036] The rod 23 is slidable internally of the first tubular shaft 38 and articulated at the bottom end by way of a second joint 25 to the second lever 16. 18 denotes a spring interposed between the first lever 24 and the rigid element 17 and serving thus to force the roller 14 permanently against the cam profile 12 and against the exposed portion 13a of the track 13.

[0037] With the head 6 in rotation, the function of the actuating means 11 and 15 is to pilot the movement of the uplifter 21 cyclically along a direction substantially parallel to the axis 7 of rotation, describing a movement dictated by the geometry of the cam profile 12 and the track 13 and by the type of adjustment selected for the movable sectors 12b.

[0038] The operation of the device 1 will now be described with reference to figs 1, 3 and 4, departing from a situation in which an advancing product 2 reaches the exit end 4u of the infeed conveyor 4 with a handler unit 9 approaching the relative vertex 30 of the looped trajectory 10. As the head 6 rotates in the direction denoted F, the platform 6a causes each set of planet wheels 28 to rotate about the sun wheel 27 with the result that the second planet wheel 28b, driven by the first planet wheel 28a, causes the sleeve 44 to rotate about the axis 45.

[0039] This in turn causes the hollow element 46 to rotate about the same axis 45, and with it, the second tubular shaft 22. During this angular movement of the sleeve 44 and the hollow element 46, the first tubular shaft 38 remains stationary and therefore the second tubular shaft 22 is rotated about its axis 22a by the belt 39, causing the uplifter 21 in turn to rotate about the same axis 22a in relation to the hollow element 46. The combined effect of these various movements is that the handler units 9 and therefore the uplifters 21 are caused to orbit about the rotational axis 7 of the head, following the looped trajectory 10.

[0040] As the uplifter 21 approaches and begins to pass around the first vertex 30, it will occupy a given position in space relative to the trajectory 10, determined by the timing of the rotation described above. Observing fig 2, in which 30 and 33 are used for convenience to denote the points, corresponding to the two vertices 30 and 33 indicated in fig 1, at which the handler units 9 reach their minimum velocity along the trajectory 10, the uplifter 21 passes around the first vertex 30 and joins the branch denoted 10a at a velocity denoted V1*, the minimum obtainable. As soon as the uplifter 21 has passed around the vertex 30 it begins to overhaul the advancing product 2, accelerating gradually and within the neighbourhood of the vertex 30 to a given velocity V2* greater than V1*, which also corresponds to a relative velocity of zero between the uplifter 21 advancing along the branch 10a and the product 2 advancing on the infeed conveyor 4 beneath.

[0041] As soon as the velocity V2* in question is reached, the actuating means 11 and 15 cause the relative uplifter 21 to descend on the product 2 at a pickup point denoted p* in figs 1, 2, and 3. In effect, the roller 14 will at this point have substantially overtaken the contour 12e of the movable sector 12b (the area denoted A in fig 6) and, forced up by the first lever 24 though the agency of the spring 18, passes from the previous position of following the cam profile 12 (where the roller 14 indicated by the phantom line in fig 6) and begins to engage the exposed portion 13a of the track 13 (see figs 3, 5A and 6). At the same time, the uplifter 21 will be repositioned in space by the orienting means 19 relative to the trajectory 10 in such a way that it assumes the correct attitude for the purposes of picking up the relative product 2. As the head 6 rotates, in effect, the arm 31 is drawn in rotation about the axis 7 by the planet wheels 28 and the roller 35 moves along the relative cam profile 36; when the roller 35 engages the lobate portions 36' of the profile, the uplifter 21 will be advancing along the branches of the trajectory 10 near to the vertices 30 and 33, with the result that the arm 31 oscillates about the relative axis 45 and the first tubular shaft 38 is caused likewise to oscillate about the same axis 45. The profile of the lobate portions 36' and their distance from the axis 7 of rotation are calculated so that an angular movement of the first tubular shaft 38 transmitted through the belt 39 will occasion a corresponding movement of the second tubular shaft 22 about its axis 22a which, when compounded with the angular movement transmitted to the selfsame second shaft 22 by the planetary train and the hollow element 46, will cause the uplifter 21 to assume the appropriate position in space relative to the product 2 during the delicate pickup step and, in similar fashion, allow of positioning the products 2 in space as appropriate when released subsequently onto the outfeed conveyor 5.

[0042] Passing beyond the pickup point p*, the uplifter 21 continues to rotate gradually about the axis 22a of the shaft 22 as indicated in fig 1.

[0043] During the descent of the uplifter 21 toward the infeed conveyor 4, the relative suction cups will be connected to a source of negative pressure by suitable switching means (which are conventional in embodiment and therefore not illustrated) in such a way that the product 2 is taken up immediately.

[0044] The operating configuration in which the product 2 is taken up and supported by the handler unit 9 will last for as long as the roller 14 continues to engage the exposed portion 13a of the track 13, and therefore the full distance interconnecting the two movable sectors 12b of the cam profile 12.

conveyor (5), and a branch (10a) extending above the feed path (3) between the same two vertices (30, 33); also actuating means (11, 15) operating mechanically one in conjunction with another, disposed and embodied in such a manner that when the head (6) is set in rotation, the uplifter (21) can be displaced along a controlled direction substantially parallel with the axis (7) of rotation toward and away from the feed path (3), and positioned thus to coincide with a point (p*) at which the products (2) are picked up from the infeed conveyor and a point (r*) at which the products are released onto the outfeed conveyor,
characterized
in that the actuating means (11, 15) are adjustably positionable in relation one to another and to the transmission means (40) in such a way as to allow of varying the position of the pickup point (p*) and the position of the release point (r*) to suit a given angular velocity of the transmission means (40).

2. A device as in claim 1, wherein the position of the pickup point (p*) is variable within a portion of the branch (10a) of the looped trajectory (10) located in the neighbourhood of the first vertex (30), and the position of the release point (r*) is variable, independently of the position of the pickup point (p*), within a portion of the branch (10a) of the looped trajectory (10) located in the neighbourhood of the second vertex (33).

3. A device as in claim 2, wherein the position of the pickup point (p*) is a function of a given feed velocity (V2*) of the handler unit (9) directed along the branch (10a) of the looped trajectory (10) and coinciding with a relative velocity of zero between the handler unit (9) and a product (2) advancing along the infeed conveyor (4) at the first velocity (V1), whilst the position of the release point (r*) is a function of a given feed velocity (V3*) of the handler unit (9) directed along the selfsame branch (10a) of the looped trajectory (10) and coinciding with a relative velocity of zero between the handler unit (9) and a product (2) advancing along the outfeed conveyor (5) at the second velocity (V2).

4. A device as in claim 1, wherein the uplifter (21) is associated with actuating means (11, 15) that comprise a cam and rocker mechanism (43) consisting in a cam (48) and a first lever (24) equipped with a roller (14) engaging and following the cam (48), of which the first lever (24) is articulated to a lever linkage (15) connected mechanically in its turn to the uplifter (21) in such a way as to bring about the movements of the uplifter cyclically along a controlled direction substantially parallel to the axis (7) of rotation, toward and away from the feed path (3), whilst the cam (48) comprises a profile (12) supported by an annular track (13) and consisting in a fixed intermediate annular sector (12a) associated rigidly with the track (13), also two movable sectors (12b) defining and compassing an exposed portion (13a) of the track (13) offered to the roller (14), which are disposed and embodied in such a manner as to allow of being displaced along the track (13) and positioned individually nearer to or farther from the fixed intermediate sector (12a) so as to lengthen or shorten the exposed portion (13a) and thus advance or retard the timing both of the pickup point (p*) and of the release point (r*).

5. A device as in claim 1, wherein the products (2) are caused to advance on the infeed conveyor (4) occupying a first position in space and thereafter on the outfeed conveyor (5) occupying a second position in space rotated through a given angle relative to the first position in space.

6. A device as in claim 1, wherein the transmission means (40) comprise an epicyclic train (26) with a fixed sun wheel (27) and sets of planet wheels (28) associated one with each of the handler units (9), each set composed of a first and a second planet wheel (28a, 28b), a sleeve (44) rigidly associated with each second planet wheel (28b), supporting a first tubular shaft (38) rotatable about its own axis (45) relative to the sleeve (44) and a hollow element (46) rotatable about the same axis (45), of which one side in turn supports a second tubular shaft (22) extending parallel to the axis (7) of rotation of the head (6) and to the axis (45) of the first shaft, rotatable likewise about its own axis (22a) and carrying a respective uplifter (21), also a flexible element (39) by way of which the second shaft (22) is connected mechanically to the first shaft (38) and caused thus to rotate during the operation of the transmission means (40), further comprising orienting means (19) disposed and embodied in such a manner as to invest the uplifter (21) with angular movement at least in relation to the feed path (3).

7. A device as in claim 6, wherein orienting means (19) comprise an arm (31) of which one end (32) is associated rigidly with the top end of the first tubular shaft (38) and the opposite end (34) serves to carry a roller (35) engaging and following a fixed cam profile (36) with three curvilinear portions including a first portion (36) extending substantially equidistant from the axis (7) of rotation around its full developable length, and two second lobate portions (36') connected one to another and both with the first portion (36), of which the arm (31) is disposed and embodied in such a way as to oscillate about the axis (45) of the first tubular shaft (38) during the movement of the roller (35) along the lobate portions (36'), thus causing the shaft (38) also to oscillate

FIG.1

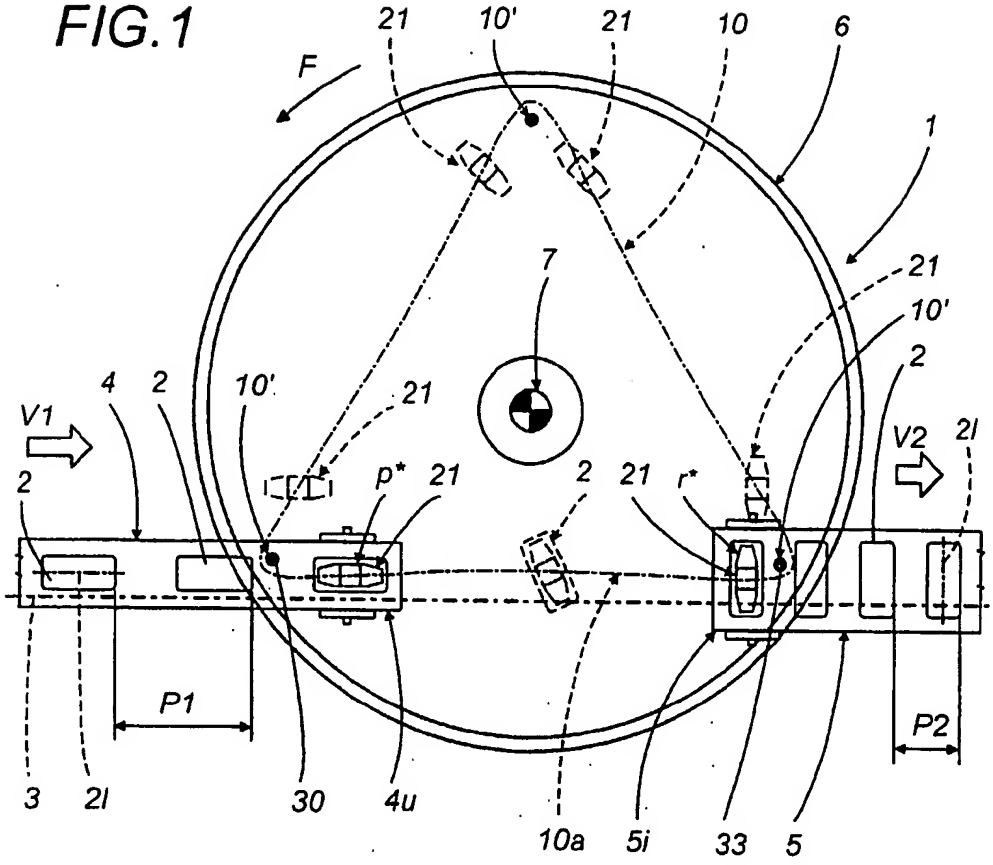


FIG.2

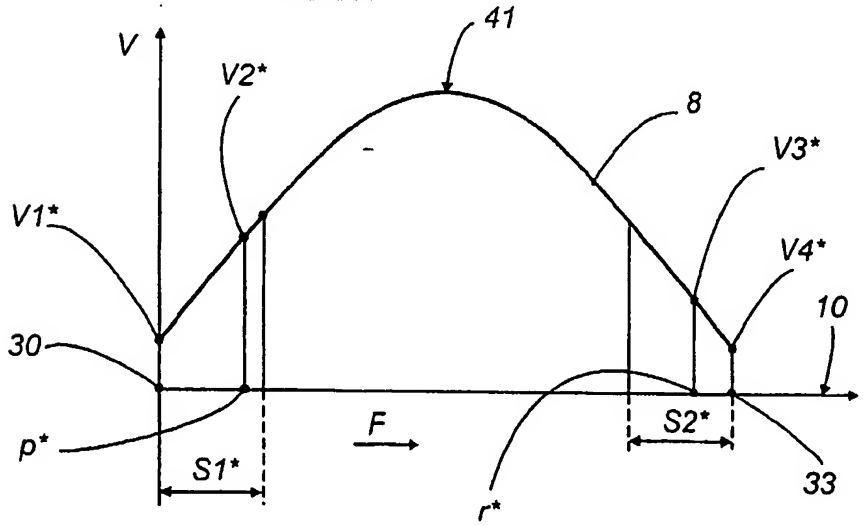


FIG.4

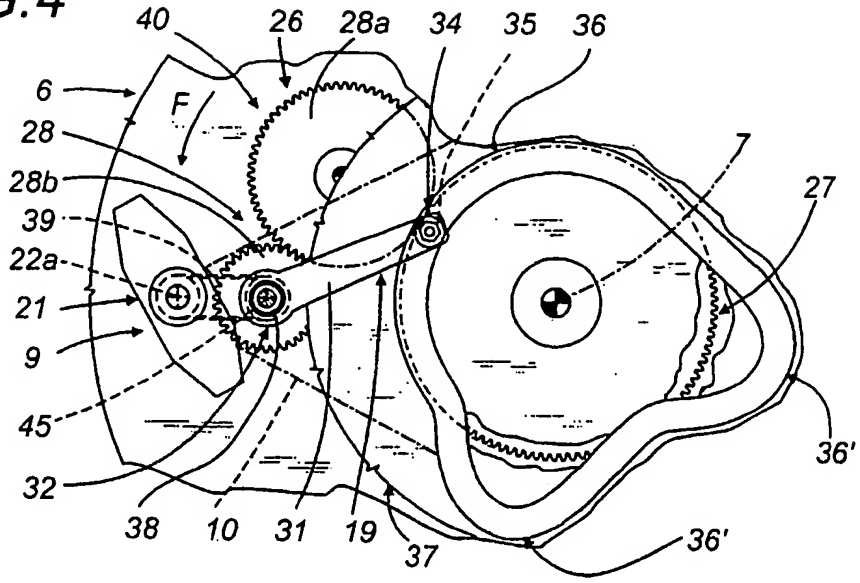


FIG.5A

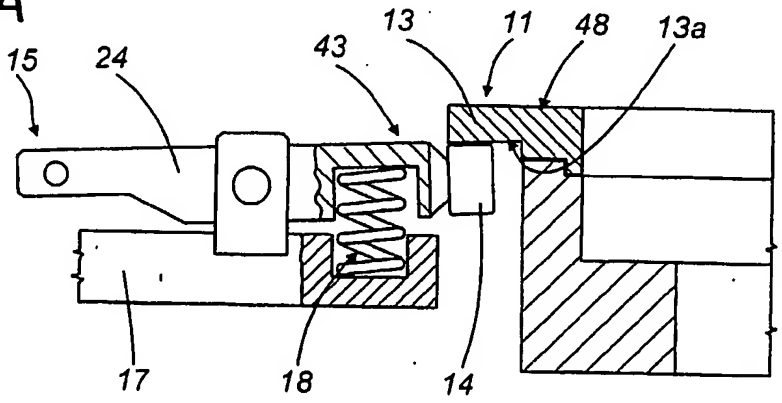
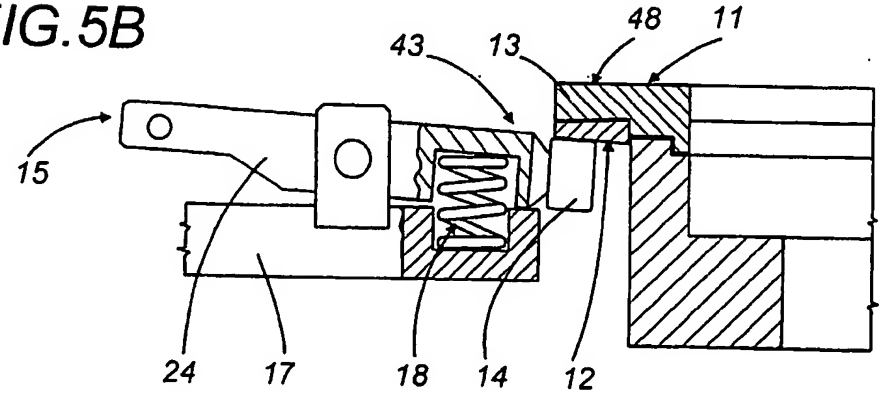


FIG.5B



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EUROPEAN SEARCH REPORT

Application Number
EP 98 83 0441

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	EP 0 576 956 A (AZIONARIA COSTRUZIONI) 5 January 1994 * column 5, line 5 - line 12; figures 4,5 *	1,5	B65G47/84
A	US 5 188 212 A (MUNSCH KLAUS) 23 February 1993 * column 5, line 3 - line 17; figure 3 *	1	
A	EP 0 731 022 A (AZIONARIA COSTRUZIONI) 11 September 1996 * figure 8 *	1	
A	EP 0 769 459 A (AZIONARIA COSTRUZIONI) 23 April 1997		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B65G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13 November 1998	Beernaert, J

CATEGORY OF CITED DOCUMENTS

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